SOLAR/2016-79/06

Monthly Performance Report

REEDY CREEK UTILITIES

JUNE 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

REEDY CREEK UTILITIES

JUNE 1979

I. SYSTEM DESCRIPTION

The Reedy Creek site is a two story, 6,100 square foot concrete block office building located in Lake Buena Vista, Florida. The solar energy system is designed to provide space heating, domestic hot water and space cooling.

The collector subsystem is composed of a horizontal array of 16 parabolic trough collectors, manufactured by AAI Corporation, with tracking absorber tubes. The collector array is an integral part of the building's roof, with the reflector troughs oriented so that each major axis is in an east-west direction. The 16 absorber tubes are moved in unison in a north-south direction by the solar tracking system. The total collector aperture area is 3,840 square feet. Water is used as the heat collection, transfer, and storage medium. Collected solar energy is stored in a 10,000-gallon hot water tank, located adjacent to the building and shaded by the roof. Domestic hot water is provided by a heat exchanger immersed in this tank. Space heating is provided by circulation of hot water from the storage tank through heat exchangers located in the central air distribution system. No auxiliary energy is provided for either domestic hot water or space heating.

A 25-ton absorption chiller utilizes hot water from solar storage to provide chilled water to a 10,000-gallon cold water storage tank. For space cooling, water from this cold tank is circulated through heat exchangers located in the building's central air distribution system. Auxiliary cooling is provided by supplemental cold water from the utility district's central chiller plant, which is powered by fossil fuels.

The system, shown schematically in Figure 1, has five modes of solar operation.

Mode 1 - Collector-to-Storage: This mode is entered when the collector absorber plate temperature is 10°F higher than the temperature at the bottom of the hot storage tank (water solar thermal storage). Water is circulated through the collector array-storage loop by pump P1 until the temperature of the water at the bottom of storage rises to within 3°F of that of the collector absorber plate.

Mode 2 - Storage-to-Space Heating: This mode is entered when the temperature falls below the setting of the thermostats located in the occupied areas. Since this is the only means of space heating available, no minimum tank temperature is specified. Pump P2 causes hot water to flow directly from the storage tank to the heat exchanger in the air-handling unit, and back to the storage tank.

Mode 3 - Domestic Hot Water Heating: Domestic hot water (DHW) is provided by passing city supply water through a heat exchanger immersed in the solar thermal storage tank. No conventional water heater exists, thus water is heated only upon demand. A tempering valve is used when necessary to reduce the temperature of water leaving the heat exchanger. If the water is too hot, cold supply water is mixed with it in the tempering valve before going to the DHW line.

Mode 4 - Chilled Water Production: This mode is entered when the temperature of the water in the top of the solar thermal storage tank is at or above the generator operating temperature (nominally 180°F) and that of the water at the bottom of the 10,000-gallon chilled water storage is greater than 45°F. Hot water is drawn from the solar thermal storage tank to operate the generator section of the absorption chiller and cold water is circulated through the chiller from the chilled water storage. Energy is removed from the cold water, lowering its temperature; the energy is rejected through the cooling tower, and the cold water returns to the chilled water storage tank. Whenever the temperature

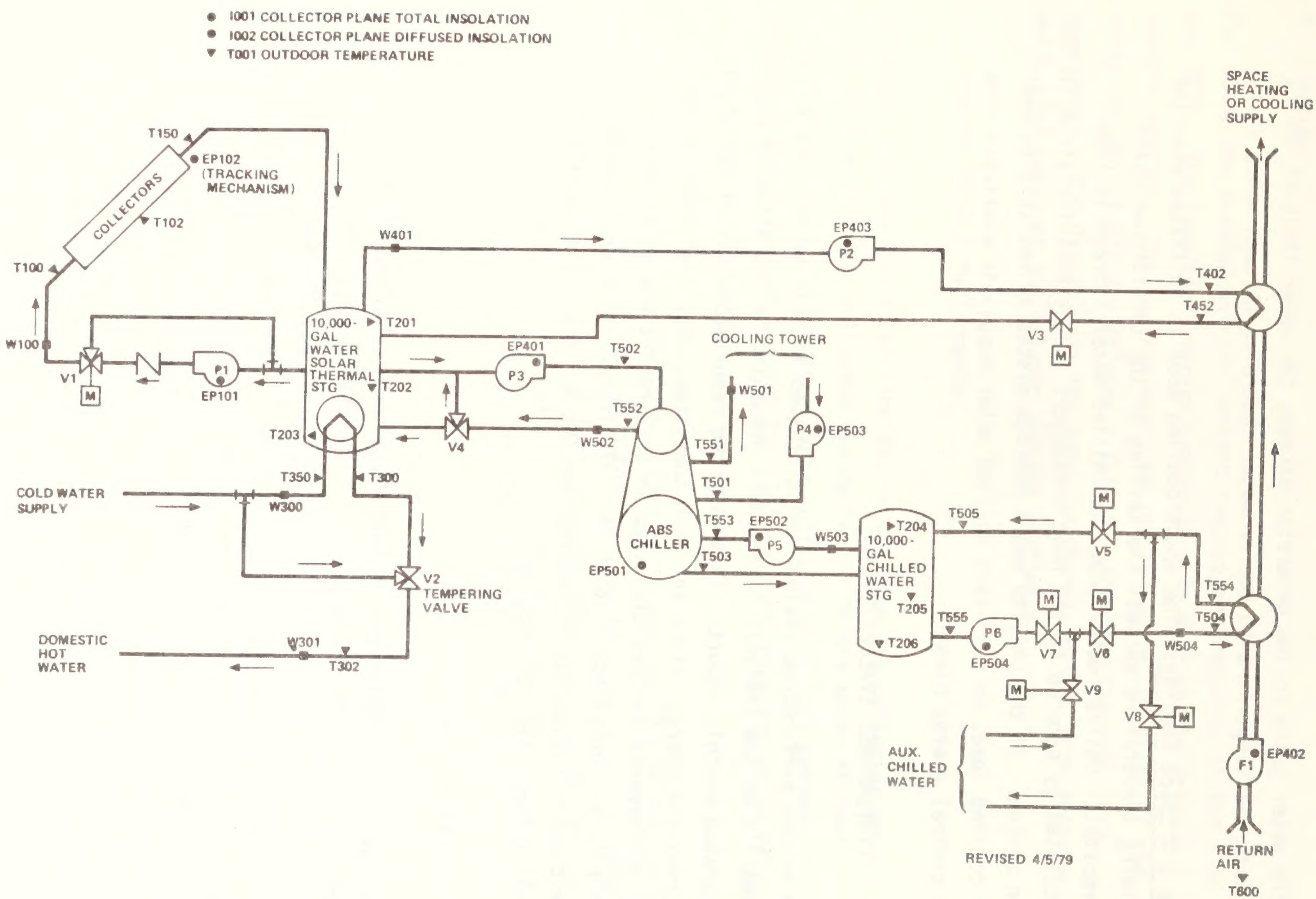

Figure 1. REEDY CREEK SOLAR ENERGY SYSTEM SCHEMATIC

of the water going to the generator exceeds the upper limit of 195°F, the water is tempered with cooler water returning through valve V4.

Mode 5 - Space Cooling: The space cooling mode is initiated when the building temperature exceeds the setting of the conditioned space thermostat. Chilled water from the chilled water storage is then circulated by pump P6 to the heat exchangers in the building air distribution system. If the chilled water storage system is not able to meet the cooling load, an auxiliary chilled water supply is available from the central energy plant.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on the analysis of the data presented in the attached computer-generated monthly report. This attached report consists of daily site thermal and energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The Reedy Creek solar energy system operated continuously throughout the month of June. The DHW demand was 0.16 million Btu, there was no space heating demand, and the space cooling demand was 18.78 million Btu. The solar energy system supplied 100 percent of the DHW requirement, and 43 percent of the space cooling requirements - these quantities are reported in the attached computer printout as loads.

B. Weather

For June, the average outside ambient temperature measured at the site was 82°F. The long-term average temperature is 81°F at the Orlando weather station. The average measured insolation in the plane of the array was only 1,826 Btu/ft^2-day. This is very near the long-term average of 1,830 Btu/ft^2-day for June, which was derived from measurements also taken at the Orlando weather station.

C. System Thermal Performance

Collector - Of the 210.33 million Btu incident on the collector array, 21.17 million Btu were collected and delivered to the solar thermal storage tank. This represents an array efficiency of 10.1 percent. Operating energy of 1.19 million Btu (348 kwh) was required to collect and store this solar energy.

Storage - Of the 21.17 million Btu delivered to storage, 13.59 million Btu were subsequently removed for use within the system. Temperature probes within the solar thermal storage tank indicate that the internal energy of the water increased by 0.43 million Btu during the month. This indicates a resulting loss to the environment of 7.15 million Btu through the tank insulation.

Domestic Hot Water - DHW is provided to the building by passing city water through a heat exchanger that is immersed in the solar thermal storage tank. A total of 303 gallons of water at an average temperature of 134°F was supplied by the system during June. The average temperature increase was 64°F, which resulted in a measured demand of 0.16 million Btu. All of this energy was supplied by the solar energy system. There was no operating energy required.

Space Heating - No space heating was required during the month of June.

Absorption Chiller - The absorption chiller operated on 11 occasions to reduce the chilled water storage temperature during June. A total of 4.29 million Btu of electrical energy from the auxiliary conventional cooling system was required to assist the absorption chiller to meet the cooling load on 23 days of the month. The absorption chiller utilized 13.43 million Btu from the solar thermal storage tank to remove 7.36 million Btu from the chilled water storage (see attached Auxiliary Performance data). The resulting coefficient of performance (COP) of 0.548 is very near the average of the past 10 months.

Chilled Water Storage - Performance of the chilled water storage (see attached Auxiliary Storage Performance data) shows that 7.36 million Btu were removed by the chiller, 8.06 million Btu were added from the conditioned space during cooling, and the internal energy of the chilled water storage increased by 0.31 million Btu. This implies that 0.40 million Btu were lost by the water to the ambient environment through the insulation.

Space Cooling - Space cooling was required on all of the working days of the month. The space cooling load was 18.78 million Btu. Water from the chilled water storage was pumped through the air duct heat exchangers to remove 8.06 million Btu from the air. Chilled water from the central plant was required to assist in supporting the cooling load during all but two of the days of the month when space cooling was required. This resulted in a space cooling solar fraction of 43 percent for the month of June.

D. Observations

The most significant anomaly observed during the month of June was the drop in collector efficiency. Normal collector efficiency has averaged near 14 percent, but during May it dropped to 12 percent, and in June it

was 10.1 percent. The loss in efficiency is partially attributable to an increase in cloud cover, which reduces the ratio of direct to total solar radiation. Since these collectors primarily collect direct radiation, this reduces their efficiency.

A collector tracking problem has recently been discovered which also significantly affects collector efficiency. This problem of the collectors mistracking the sun resulted in collection beginning almost an hour later in June than in April, and generally continuing for an hour longer in June than in April. Apparently the mistracking began to occur in May. It should be corrected during July.

Losses from both storage tanks were below their typical levels, which have generally been higher than expected for their design. It is expected that there will always be a significant variance in the calculated values of tank losses. This uncertainty arises from the fact that this calculation involves the measurement of small changes in storage temperature, which may be biased by thermal stratification within the tank, fluctuations in temperatures during the course of the 24-hour period over which it is averaged, and small sensor inaccuracies.

Investigations are being made in an attempt to determine the accuracy of several temperature sensors, and to improve them if possible.

E. Energy Savings

A total electrical energy savings of 0.36 million Btu (107 kwh) was realized. This value assumes that, had there not been a solar energy system, the energy requirements would have been met by an electrical hot water heater and by a conventional electrical heat pump.

III. ACTION STATUS

The accuracy of the several temperature sensors in the space cooling system are being investigated.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SOLAR/2018-79/06

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SITE/SYSTEM DESCRIPTION:
THE REEDY CREEK SITE IS A 6100 SQ. FT. CONCRETE BLOCK OFFICE BUILDING. THE LIQUID SYSTEM EMPLOYS 3840 SQ. FT. OF PARABOLIC TROUGH COLLECTORS WHICH FORM AN INTEGRAL PART OF THE ROOF. THE SYSTEM IS DESIGNED TO PROVIDE SPACE HEATING, COOLING, AND DOMESTIC HOT WATER. STORAGE CONSISTS OF 10,000 GALLONS OF BOTH HOT AND COLD WATER. AN ABSORPTION CYCLE CHILLER PROVIDES COOLING, A RADIANT HOT WATER COIL PROVIDES HEATING AND A COIL SUBMERGED IN THE HOT STORAGE TANK PROVIDES HOT WATER. AUXILIARY COOLING IS PROVIDED BY CHILLED WATER FROM THE CENTRAL COOLING PLANT. THERE IS NO AUXILIARY DHW OR HEATING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	210.328	MILLION BTU
	54773	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	21.166	MILLION BTU
	5512	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	82	DEGREES F
AVERAGE BUILDING TEMPERATURE	78	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.06	
ECSS OPERATING ENERGY	1.187	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	5.053	MILLION BTU
TOTAL ENERGY CONSUMED	30.506	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	0.156	0.000	18.779	18.935	MILLION BTU
SOLAR FRACTION	100	0	43	43	PERCENT
SOLAR ENERGY USED	0.156	0.000	13.431	13.587	MILLION BTU
OPERATING ENERGY	N.A.	0.000	3.866	5.053	MILLION BTU
AUX. THERMAL ENERGY	N.A.	N.A.	10.715	10.715	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	4.286	4.286	MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
ELECTRICAL SAVINGS	0.156	0.000	1.395	0.364	MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.609

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

SITE/SYSTEM DESCRIPTION:
THE REEDY CREEK SITE IS A 6100 SQ. FT. CONCRETE BLOCK OFFICE BUILDING. THE LIQUID SYSTEM EMPLOYS 3840 SQ. FT. OF PARABOLIC TROUGH COLLECTORS WHICH FORM AN INTEGRAL PART OF THE ROOF. THE SYSTEM IS DESIGNED TO PROVIDE SPACE HEATING, COOLING, AND DOMESTIC HOT WATER. STORAGE CONSISTS OF 10,000 GALLONS OF BOTH HOT AND COLD WATER. AN ABSORPTION CYCLE CHILLER PROVIDES COOLING, A RADIANT HOT WATER COIL PROVIDES HEATING AND A COIL SUBMERGED IN THE HOT STORAGE TANK PROVIDES HOT WATER. AUXILIARY COOLING IS PROVIDED BY CHILLED WATER FROM THE CENTRAL COOLING PLANT. THERE IS NO AUXILIARY DHW OR HEATING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	221.896	GIGA JOULES
	622002	KJ/SQ.M.
COLLECTED SOLAR ENERGY	22.330	GIGA JOULES
	62595	KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	28	DEGREES C
AVERAGE BUILDING TEMPERATURE	26	DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.06	
ECSS OPERATING ENERGY	1.253	GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	5.331	GIGA JOULES
TOTAL ENERGY CONSUMED	32.183	GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	0.165	0.000	19.812	19.977	GIGA JOULES
SOLAR FRACTION	100	0	43	43	PERCENT
SOLAR ENERGY USED	0.165	0.000	14.170	14.334	GIGA JOULES
OPERATING ENERGY	N.A.	0.000	4.079	5.331	GIGA JOULES
AUX. THERMAL ENG	N.A.	N.A.	11.304	11.304	GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	4.522	4.522	GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	GIGA JOULES
ELECTRICAL SAVINGS	0.165	0.000	1.472	0.383	GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.609

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	7.192	83	0.004	N	0.046	N	0.001
2	7.160	83	1.446	O	0.047	O	0.202
3	7.736	84	0.000	T	0.051	T	0.000
4	8.223	83	1.543		0.057		0.108
5	6.991	82	0.005	A	0.035	A	0.001
6	8.480	84	1.327	P	0.061	P	0.157
7	8.052	86	0.011	P	0.053	P	0.001
8	6.315	83	0.012	L	0.024	L	0.002
9	7.845	81	1.222	I	0.042	I	0.156
10	8.659	81	0.000	C	0.053	C	0.000
11	8.732	82	1.686	A	0.057	A	0.193
12	2.924	77	0.003	B	0.000	B	0.001
13	3.935	77	0.004	L	0.000	L	0.001
14	5.324	79	0.006	E	0.017	E	0.001
15	7.430	81	0.003		0.040		0.000
16	6.419	80	0.000		0.031		0.000
17	7.339	83	0.857		0.042		0.117
18	8.760	84	0.956		0.059		0.109
19	8.125	85	0.007		0.050		0.001
20	6.831	83	0.781		0.027		0.114
21	5.968	82	0.008		0.030		0.001
22	6.119	80	0.008		0.038		0.001
23	7.678	80	1.253		0.054		0.163
24	8.313	83	0.000		0.053		0.000
25	8.006	85	1.295		0.053		0.162
26	7.100	80	0.008		0.045		0.001
27	3.755	77	0.012		0.010		0.003
28	6.591	81	0.012		0.027		0.002
29	6.850	80	1.119		0.038		0.163
30	7.478	82	0.000		0.046		0.000
SUM	210.328	-	13.587	N.A.	1.187	N.A.	-
AVG	7.011	82	0.453	N.A.	0.040	N.A.	0.065
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	7.192	4.774	0.939	93	0.131
2	7.160	4.776	1.062	92	0.148
3	7.736	4.833	0.906	93	0.117
4	8.223	5.854	1.117	92	0.136
5	6.991	3.426	0.515	90	0.074
6	8.480	6.215	1.204	92	0.142
7	8.052	5.417	0.985	97	0.122
8	6.315	2.635	0.252	91	0.040
9	7.845	4.437	0.823	89	0.105
10	8.659	5.657	1.010	88	0.117
11	8.732	6.023	1.142	90	0.131
12	2.924	0.000	0.000	82	0.000
13	3.935	0.000	0.000	82	0.000
14	5.324	1.562	0.188	84	0.035
15	7.430	4.228	0.728	89	0.098
16	6.419	3.514	0.378	86	0.059
17	7.339	4.250	0.799	91	0.109
18	8.760	6.162	1.220	95	0.139
19	8.125	5.238	0.914	95	0.113
20	6.831	2.932	0.327	93	0.048
21	5.968	3.135	0.412	92	0.069
22	6.119	3.954	0.634	93	0.104
23	7.678	5.361	0.970	91	0.126
24	8.313	5.338	0.873	93	0.105
25	8.006	5.241	0.944	94	0.118
26	7.100	4.700	0.793	90	0.112
27	3.755	1.175	0.118	84	0.031
28	6.591	2.902	0.448	88	0.068
29	6.850	3.920	0.673	90	0.098
30	7.478	4.518	0.794	89	0.106
SUM	210.328	122.275	21.166	-	-
AVG	7.011	4.076	0.706	90	0.101
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.939	0.004	0.649	166	0.694
2	1.062	1.446	-0.732	167	0.672
3	0.906	0.000	0.649	165	0.716
4	1.117	1.543	-0.554	167	0.885
5	0.515	0.005	0.262	164	0.518
6	1.204	1.327	-0.377	164	0.789
7	0.985	0.011	0.701	165	0.723
8	0.252	0.012	0.010	170	0.088
9	0.823	1.222	-0.701	166	0.633
10	1.010	0.000	0.764	166	0.756
11	1.142	1.686	-0.764	166	0.807
12	0.000	0.003	-0.283	159	1.000
13	0.000	0.004	-0.221	155	1.000
14	0.188	0.006	0.021	155	0.144
15	0.728	0.003	0.504	158	0.696
16	0.378	0.000	0.241	163	0.638
17	0.799	0.857	-0.230	164	0.784
18	1.220	0.956	0.052	163	0.827
19	0.914	0.007	0.596	166	0.660
20	0.327	0.781	-0.565	167	0.659
21	0.412	0.008	0.052	162	0.147
22	0.634	0.008	0.429	166	0.690
23	0.970	1.253	-0.565	165	0.709
24	0.873	0.000	0.586	165	0.671
25	0.944	1.295	-0.513	166	0.828
26	0.793	0.008	0.523	165	0.669
27	0.118	0.012	-0.188	167	-1.497
28	0.448	0.012	0.220	168	0.516
29	0.673	1.119	-0.691	166	0.637
30	0.794	0.000	0.555	164	0.699
SUM	21.166	13.587	0.429	-	-
AVG	0.706	0.453	0.014	164	0.662
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.004	100	0.004	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	0.004	NOT APPLICABLE	70	128	8
2	0.000	0	0.000					0.000		70	132	0
3	0.000	0	0.000					0.000		70	132	0
4	0.010	100	0.010					0.010		70	134	18
5	0.005	100	0.005					0.005		70	136	11
6	0.009	100	0.009					0.009		70	136	15
7	0.011	100	0.011					0.011		70	135	21
8	0.012	100	0.012					0.012		70	140	22
9	0.002	100	0.002					0.002		70	142	4
10	0.000	0	0.000					0.000		70	141	0
11	0.005	100	0.005					0.005		70	130	10
12	0.003	100	0.003					0.003		70	136	6
13	0.004	100	0.004					0.004		70	114	13
14	0.006	100	0.006					0.006		70	125	13
15	0.003	100	0.003					0.003		70	121	8
16	0.000	0	0.000					0.000		70	127	0
17	0.000	0	0.000					0.000		70	127	0
18	0.007	100	0.007					0.007		70	136	14
19	0.007	100	0.007					0.007		70	142	13
20	0.006	100	0.006					0.006		70	138	10
21	0.008	100	0.008					0.008		70	137	15
22	0.008	100	0.008					0.008		70	135	16
23	0.000	0	0.000					0.000		70	134	0
24	0.000	0	0.000					0.000		70	134	0
25	0.008	100	0.008					0.008		70	140	13
26	0.008	100	0.008					0.008		70	137	15
27	0.012	100	0.012					0.012		70	137	21
28	0.012	100	0.012					0.012		70	139	22
29	0.007	100	0.007					0.007		70	143	13
30	0.000	0	0.000					0.000		70	143	0
SUM	0.156	-	0.156	N.A.	N.A.	N.A.	N.A.	0.156	N.A.	-	-	303
AVG	0.005	100	0.005	N.A.	N.A.	N.A.	N.A.	0.005	N.A.	70	134	10
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	0.000	NOT APPLICABLE	78	83
2	0.000	0	0.000	0.000				0.000		79	83
3	0.000	0	0.000	0.000				0.000		80	84
4	0.000	0	0.000	0.000				0.000		78	83
5	0.000	0	0.000	0.000				0.000		78	82
6	0.000	0	0.000	0.000				0.000		79	84
7	0.000	0	0.000	0.000				0.000		80	86
8	0.000	0	0.000	0.000				0.000		78	83
9	0.000	0	0.000	0.000				0.000		80	81
10	0.000	0	0.000	0.000				0.000		80	81
11	0.000	0	0.000	0.000				0.000		77	82
12	0.000	0	0.000	0.000				0.000		76	77
13	0.000	0	0.000	0.000				0.000		76	77
14	0.000	0	0.000	0.000				0.000		77	79
15	0.000	0	0.000	0.000				0.000		77	81
16	0.000	0	0.000	0.000				0.000		79	80
17	0.000	0	0.000	0.000				0.000		81	83
18	0.000	0	0.000	0.000				0.000		78	84
19	0.000	0	0.000	0.000				0.000		79	85
20	0.000	0	0.000	0.000				0.000		78	83
21	0.000	0	0.000	0.000				0.000		78	82
22	0.000	0	0.000	0.000				0.000		77	80
23	0.000	0	0.000	0.000				0.000		77	80
24	0.000	0	0.000	0.000				0.000		91	83
25	0.000	0	0.000	0.000				0.000		79	85
26	0.000	0	0.000	0.000				0.000		77	80
27	0.000	0	0.000	0.000				0.000		76	77
28	0.000	0	0.000	0.000				0.000		77	81
29	0.000	0	0.000	0.000				0.000		77	90
30	0.000	0	0.000	0.000				0.000		80	82
SUM	0.000	-	0.000	0.000	N.A.	N.A.	N.A.	0.000	N.A.	-	-
AVG	0.000	0	0.000	0.000	N.A.	N.A.	N.A.	0.000	N.A.	78	82
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE COOLING SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MON.	SPACE COOLING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG DRY BULB TEMP F	AMB TEMP DEG F
1	1.590	36	0.000	0.171	1.020	0.408	N	0.211	N	78	83
2	0.571	51	1.446	0.246	0.278	0.111	O	-0.064	O	79	83
3	0.196	0	0.000	0.010	0.196	0.079	T	-0.000	T	80	84
4	0.879	47	1.533	0.303	0.467	0.187		-0.059		78	83
5	1.346	85	0.000	0.162	0.197	0.079	A	0.431	A	78	82
6	0.383	35	1.319	0.187	0.249	0.100	P	-0.084	P	79	84
7	0.514	47	0.000	0.046	0.273	0.109	P	0.091	P	80	86
8	0.702	18	0.000	0.060	0.577	0.231	L	0.046	L	78	83
9	0.000	0	1.220	0.148	0.000	0.000	I	-0.148	I	80	81
10	0.000	0	0.000	0.000	0.000	0.000	C	0.000	C	80	81
11	1.301	100	1.681	0.338	0.000	0.000	A	0.319	A	77	82
12	0.280	38	0.000	0.032	0.174	0.070	B	0.039	B	76	77
13	0.656	100	0.000	0.177	0.000	0.000	L	0.228	L	75	77
14	0.475	49	0.000	0.104	0.241	0.096	E	0.078	E	77	79
15	0.230	25	0.000	0.026	0.173	0.069		0.021		77	81
16	0.087	0	0.000	0.005	0.087	0.035		0.000		79	80
17	0.000	0	0.857	0.090	0.000	0.000		-0.090		81	83
18	0.093	0	0.949	0.109	0.093	0.037		-0.102		78	84
19	0.326	47	0.000	0.031	0.173	0.069		0.058		79	85
20	0.963	33	0.775	0.220	0.643	0.257		0.016		78	83
21	1.451	35	0.000	0.166	0.939	0.375		0.189		78	82
22	0.941	29	0.000	0.160	0.672	0.269		0.090		77	80
23	0.432	56	1.253	0.189	0.189	0.076		-0.053		77	80
24	0.000	0	0.000	0.000	0.000	0.000		0.000		81	83
25	0.919	27	1.287	0.248	0.667	0.267		-0.070		79	85
26	1.077	51	0.000	0.121	0.527	0.211		0.204		77	80
27	0.914	28	0.000	0.118	0.657	0.263		0.092		76	77
28	1.213	14	0.000	0.140	1.048	0.419		0.059		77	81
29	1.242	6	1.112	0.258	1.174	0.470		-0.108		77	80
30	0.000	0	0.000	0.000	0.000	0.000		0.000		80	82
SUM	18.779	-	13.431	3.866	10.715	4.286	N.A.	1.395	N.A.	-	-
AVG	0.626	43	0.448	0.129	0.357	0.143	N.A.	0.046	N.A.	78	82
NBS	Q502	N500	Q500	Q503	Q501		Q508	Q512	Q514	N406	N113

* DENOTES UNAVAILABLE DATA.
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N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1873	463	83	93	N	N	N
2	1865	516	83	92	O	O	O
3	2014	531	84	93	T	T	T
4	2141	521	83	92			
5	1820	655	82	90	A	A	A
6	2208	449	84	92	P	P	P
7	2097	497	86	97	P	P	P
8	1645	744	83	91	L	L	L
9	2043	453	81	89	I	I	I
10	2255	493	81	88	C	C	C
11	2274	493	82	90	A	A	A
12	761	621	77	82	B	B	B
13	1025	817	77	82	L	L	L
14	1386	770	79	84	E	E	E
15	1935	611	81	89			
16	1572	750	80	86			
17	1911	507	83	91			
18	2281	463	84	95			
19	2116	600	85	95			
20	1779	859	83	93			
21	1554	807	82	92			
22	1593	575	80	93			
23	1999	509	80	91			
24	2165	641	83	93			
25	2085	568	85	94			
26	1849	620	80	90			
27	978	639	77	84			
28	1717	688	81	88			
29	1784	573	80	90			
30	1947	571	82	89			
SUM	54773	18001	-	-	-	-	-
AVG	1826	600	82	90	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: REEDY CREEK SOLAR/2018-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.000	0.000	0.000	0.000	0.000
2	0.866	1.446	0.170	2.538	0.599
3	0.000	0.000	0.000	0.000	0.000
4	0.758	1.533	0.215	2.354	0.494
5	0.000	0.000	0.000	0.000	0.000
6	0.748	1.319	0.130	2.190	0.567
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.725	1.220	0.148	2.204	0.594
10	0.000	0.000	0.000	0.000	0.000
11	0.938	1.681	0.170	2.800	0.558
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	-0.010	0.000
14	0.000	0.000	0.000	-0.005	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.482	0.857	0.090	1.413	0.563
18	0.484	0.949	0.102	1.543	0.510
19	0.000	0.000	0.000	0.000	0.000
20	0.383	0.775	0.099	1.206	0.494
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.728	1.253	0.143	2.218	0.581
24	0.000	0.000	0.000	0.000	0.000
25	0.640	1.287	0.165	2.025	0.498
26	0.000	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000
29	0.609	1.112	0.132	1.811	0.548
30	0.000	0.000	0.000	0.000	0.000
SUM	7.361	13.431	1.564	22.288	0.548
AVG	0.245	0.448	0.052	0.743	0.018

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
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NOTE:

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
AUXILIARY STORAGE PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: JUNE,1979

SOLAR/2018-79/06

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	INCREASE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.570	0.000	0.515	59	1.000
2	0.293	0.866	-0.590	60	1.019
3	0.000	0.000	0.071	56	1.000
4	0.411	0.758	-0.478	55	1.175
5	1.148	0.000	1.017	57	1.000
6	0.134	0.748	-0.426	61	0.749
7	0.241	0.000	0.093	58	1.000
8	0.125	0.000	0.187	60	1.000
9	0.000	0.725	-0.728	57	1.005
10	0.000	0.000	0.052	52	1.000
11	1.301	0.938	0.179	54	1.196
12	0.105	0.000	0.168	56	1.000
13	0.656	0.000	0.706	62	1.000
14	0.234	0.000	0.153	66	1.000
15	0.057	0.000	0.067	68	1.000
16	0.000	0.000	0.074	68	1.000
17	0.000	0.482	-0.403	67	0.335
18	0.000	0.484	-0.545	62	1.125
19	0.153	0.000	0.082	58	1.000
20	0.319	0.383	-0.041	59	0.941
21	0.513	0.000	0.366	60	1.000
22	0.269	0.000	0.299	65	1.000
23	0.242	0.728	-0.534	63	1.066
24	0.000	0.000	0.049	60	1.000
25	0.253	0.640	-0.478	58	1.141
26	0.550	0.000	0.501	57	1.000
27	0.256	0.000	0.239	62	1.000
28	0.165	0.000	0.160	64	1.000
29	0.068	0.609	-0.478	63	0.397
30	0.000	0.000	0.030	60	1.000
SUM	8.064	7.361	0.307	-	-
AVG	0.269	0.245	0.010	60	1.054

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☆U.S. GOVERNMENT PRINTING OFFICE: 1979-640-189/4168. Region 4.